

RILEM State-of-the-Art Reports

Mario de Rooij
Kim Van Tittelboom
Nele De Belie
Erik Schlangen *Editors*

Self-Healing Phenomena in Cement-Based Materials

State-of-the-Art Report of RILEM
Technical Committee 221-SHC:
Self-Healing Phenomena
in Cement-Based Materials



 Springer

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RILEM State-of-the-Art Reports

Volume 11

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Foreword

Self-healing materials are man-made materials, which have the built-in capability to repair structural damage autogenously or with the minimal help of an external stimulus. Self-healing materials is a new dynamically developing area of materials research. Since healing presupposes the presence of a defect and a defect generally emerges at a very small scale, probably at the nanoscale, it is not surprising that self-healing is one of the promising application fields of nanotechnology.

Self-healing of cement-based materials is not a completely new issue. As early as 1836 the French Academy of Science has reported about self-healing in water retaining structures, culverts and pipes. Those and later studies in the first half of the twentieth century often concentrated on leakage problems in liquid retaining structures, but also studies on healing of cracks in bridges were mentioned. Some twenty years ago work on self-healing of cementitious materials has been published in which it was shown that the so called Kaiser effect (absence of acoustic emission, which is usually observed at repeated loading of structural element, until the load exceeds the previously achieved level) disappears for concrete kept under water for a long time before a new loading. Recently self-healing of microcracks has been suggested the reason why the diffusion coefficient of concrete in marine structures reduces with time. Thus self-healing would become a relevant factor in view of the service life of concrete structures and hence contributes to the sustainability of the built environment.

The present State-of-the-Art Report has been prepared jointly by the members of the RILEM Technical Committee TC 221-SHC "Self-Healing Phenomena in Cement-Based Materials" during the years 2005–2012, under the leadership of its chair Prof. Erik Schlangen and secretary Dr. Mario De Rooij. The report summarizes the knowledge gained by the international research community working in this field for the last 20–25 years. Developing concepts for self-healing by design, or active self-healing, was considered the main topic and challenge of this RILEM committee. In view of this, this State-of-the-Art is unique. I have no doubt that the experts dealing with advanced materials (not only concrete) will enjoy reading this book, find much new information and fresh ideas for the implementation of the materials and methods promoting self-healing in concrete, sealers, coatings and other engineering materials.

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